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L1	35	Bayesian and dependencies and flowchart and prior and test	USPAT	OR	OFF	2007/07/17 20:10
L2	79	Bayesian and dependencies and flowchart and prior and test	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/07/17 20:11
L3	1	"probabilistic graph" and dependencies and "decision flowchart" and prior and "test nodes" and "outcome states" and "conditional probabilities" and "conclusion links"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/07/17 20:17
L4	1	"probabilistic graph" and dependencies and "decision flowchart" and prior and "test nodes" and "outcome states" and "conditional probabilities" and "conclusion links" .clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/07/17 20:17

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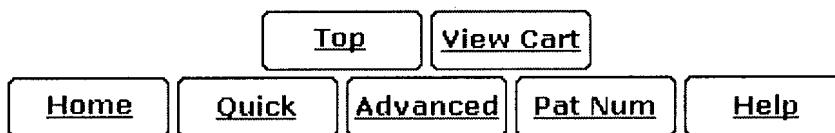
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PAT. NO. Title

- 1 7,231,327 T Method and apparatus for risk management
- 2 7,213,047 T Peer trust evaluation using mobile agents in peer-to-peer networks
- 3 7,194,114 T Object finder for two-dimensional images, and system for determining a set of sub-classifiers composing an object finder
- 4 7,187,800 T Method and apparatus for image segmentation using Jensen-Shannon divergence and Jensen-Renyi divergence
- 5 7,162,522 T User profile classification by web usage analysis
- 6 7,130,779 T Method and apparatus for risk management
- 7 7,107,253 T Computer architecture and process of patient generation, evolution and simulation for computer based testing system using bayesian networks as a scripting language
- 8 7,043,415 T Interactive graphical environment for drug model generation
- 9 7,024,399 T Computer architecture and process of patient generation, evolution, and simulation for computer based testing system using bayesian networks as a scripting language
- 10 7,020,642 T System and method for pre-processing input data to a support vector machine
- 11 6,978,244 T Computer architecture and process of patient generation, evolution, and simulation for computer based testing system
- 12 6,957,202 T Model selection for decision support systems
- 13 6,950,786 T Method and apparatus for generating a cross plot in attribute space from a plurality of attribute data sets and generating a class data set from the cross plot
- 14 6,944,317 T Method for motion classification using switching linear dynamic systems models
- 15 6,941,303 T System and method for organizing, compressing and structuring data for data mining readiness
- 16 6,940,545 T Face detecting camera and method
- 17 6,934,748 T Automated on-line experimentation to measure users behavior to treatment for a set of content elements
- 18 6,807,537 T Mixtures of Bayesian networks
- 19 6,735,549 T Predictive maintenance display system

- 20 [6,694,044 T Method for motion classification using switching linear dynamic system models](#)
21 [6,691,249 T Probabilistic diagnosis, in particular for embedded and remote applications](#)
22 [6,633,852 T Preference-based catalog browser that utilizes a belief network](#)
23 [6,591,146 T Method for learning switching linear dynamic system models from data](#)
24 [6,584,455 T System and method for predicting design errors in integrated circuits](#)
25 [6,553,548 T System and method for recovering from design errors in integrated circuits](#)
26 [6,529,891 T Automatic determination of the number of clusters by mixtures of bayesian networks](#)
27 [6,496,816 T Collaborative filtering with mixtures of bayesian networks](#)
28 [6,408,290 T Mixtures of bayesian networks with decision graphs](#)
29 [6,345,265 T Clustering with mixtures of bayesian networks](#)
30 [6,336,108 T Speech recognition with mixtures of bayesian networks](#)
31 [6,246,975 T Computer architecture and process of patient generation, evolution, and simulation for computer based testing system](#)
32 [6,154,736 T Belief networks with decision graphs](#)
33 [5,883,326 T Music composition](#)
34 [5,736,666 T Music composition](#)
35 [5,704,017 T Collaborative filtering utilizing a belief network](#)
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1 Conference abstracts

◆ January 1977 **Proceedings of the 5th annual ACM computer science conference CSC '77**

Publisher: ACM Press

Full text available: [pdf\(3.14 MB\)](#)Additional Information: [full citation](#), [abstract](#), [index terms](#)

One problem in computer program testing arises when errors are found and corrected after a portion of the tests have run properly. How can it be shown that a fix to one area of the code does not adversely affect the execution of another area? What is needed is a quantitative method for assuring that new program modifications do not introduce new errors into the code. This model considers the retest philosophy that every program instruction that could possibly be reached and tested from the ...



2 Models and Measurements for Quality Assessment of Software

◆ September 1979 **ACM Computing Surveys (CSUR)**, Volume 11 Issue 3

Publisher: ACM Press

Full text available: [pdf\(1.95 MB\)](#)Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

3 Modeling dependencies in protein-DNA binding sites

◆ April 2003 **Proceedings of the seventh annual international conference on Research in computational molecular biology RECOMB '03**

Publisher: ACM Press

Full text available: [pdf\(411.94 KB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The availability of whole genome sequences and high-throughput genomic assays opens the door for *in silico* analysis of transcription regulation. This includes methods for discovering and characterizing the binding sites of DNA-binding proteins, such as transcription factors. A common representation of transcription factor binding sites is a *position specific score matrix* (PSSM). This representation makes the strong assumption that binding site positions are independent of each other ...

Keywords: DNA sequence motifs, bayesian networks, factors binding sites, transcription



4 Relational Dependency Networks

Jennifer Neville, David Jensen

May 2007 **The Journal of Machine Learning Research**, Volume 8

Publisher: MIT Press

Full text available: [pdf\(1.17 MB\)](#) Additional Information: [full citation](#), [abstract](#)

Recent work on graphical models for relational data has demonstrated significant improvements in classification and inference when models represent the dependencies among instances. Despite its use in conventional statistical models, the assumption of instance independence is contradicted by most relational data sets. For example, in citation data there are dependencies among the topics of a paper's references, and in genomic data there are dependencies among the functions of interacting prot ...

5 "AU: Timing Analysis Under Uncertainty

Sarvesh Bhardwaj, Sarma B. K. Vrudhula, David Blaauw

November 2003 **Proceedings of the 2003 IEEE/ACM international conference on Computer-aided design ICCAD '03**

Publisher: IEEE Computer Society

Full text available: [pdf\(171.27 KB\)](#) Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)

Due to excessive reduction in the gate length, dopant concentrations and the oxide thickness, even the slightest of variations in these quantities can result in significant variations in the performance of a device. This has resulted in a need for efficient and accurate techniques for performing Statistical Analysis of circuits. In this paper we propose a methodology based on Bayesian Networks for computing the exact probability distribution of the delay of a circuit. In case of large circuits where it ...

6 The interdisciplinary study of coordination

Thomas W. Malone, Kevin Crowston

March 1994 **ACM Computing Surveys (CSUR)**, Volume 26 Issue 1

Publisher: ACM Press

Full text available: [pdf\(584.94 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

This survey characterizes an emerging research area, sometimes called coordination theory, that focuses on the interdisciplinary study of coordination. Research in this area uses and extends ideas about coordination from disciplines such as computer science, organization theory, operations research, economics, linguistics, and psychology. A key insight of the framework presented here is that coordination can be seen as the process of managing dependencies ...

Keywords: computer-supported cooperative work, coordination, coordination science, coordination theory, groupware

7 Building Blocks for Variational Bayesian Learning of Latent Variable Models

Tapani Raiko, Harri Valpola, Markus Harva, Juha Karhunen

May 2007 **The Journal of Machine Learning Research**, Volume 8

Publisher: MIT Press

Full text available: [pdf\(487.10 KB\)](#) Additional Information: [full citation](#), [abstract](#)

We introduce standardised building blocks designed to be used with variational Bayesian learning. The blocks include Gaussian variables, summation, multiplication, nonlinearity, and delay. A large variety of latent variable models can be constructed from these blocks, including nonlinear and variance models, which are lacking from most existing variational systems. The introduced blocks are designed to fit together and to yield efficient update rules. Practical implementation of various model ...

8 Bayesian Segmental Models with Multiple Sequence Alignment Profiles for Protein Secondary Structure and Contact Map Prediction

Wei Chu, Zoubin Ghahramani, Alexei Podtelezhnikov, David L. Wild

April 2006 **IEEE/ACM Transactions on Computational Biology and Bioinformatics**

(TCBB), Volume 3 Issue 2

Publisher: IEEE Computer Society Press

Full text available:  pdf(1.80 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we develop a segmental semi-Markov model (SSMM) for protein secondary structure prediction which incorporates multiple sequence alignment profiles with the purpose of improving the predictive performance. The segmental model is a generalization of the hidden Markov model where a hidden state generates segments of various length and secondary structure type. A novel parameterized model is proposed for the likelihood function that explicitly represents multiple sequence alignment pr ...

Keywords: Bayesian segmental semi-Markov models, generative models, protein secondary structure, contact maps, multiple sequence alignment profiles, parametric models.

9 A Scoring Function for Learning Bayesian Networks based on Mutual Information and Conditional Independence Tests 

Luis M. de Campos

December 2006 **The Journal of Machine Learning Research**, Volume 7

Publisher: MIT Press

Full text available:  pdf(395.64 KB) Additional Information: [full citation](#), [abstract](#)

We propose a new scoring function for learning Bayesian networks from data using score+search algorithms. This is based on the concept of mutual information and exploits some well-known properties of this measure in a novel way. Essentially, a statistical independence test based on the chi-square distribution, associated with the mutual information measure, together with a property of additive decomposition of this measure, are combined in order to measure the degree of interaction between ea ...

10 Learning with mixtures of trees 

Marina Meila, Michael I. Jordan

September 2001 **The Journal of Machine Learning Research**, Volume 1

Publisher: MIT Press

Full text available:  pdf(400.02 KB) Additional Information: [full citation](#), [abstract](#), [citations](#)

This paper describes the mixtures-of-trees model, a probabilistic model for discrete multidimensional domains. Mixtures-of-trees generalize the probabilistic trees of Chow and Liu (1968) in a different and complementary direction to that of Bayesian networks. We present efficient algorithms for learning mixtures-of-trees models in maximum likelihood and Bayesian frameworks. We also discuss additional efficiencies that can be obtained when data are "sparse," and we present data structures and alg ...

11 Effective image and video mining: an overview of model-based approaches 

 Rokia Missaoui, Roman M. Palenichka

August 2005 **Proceedings of the 6th international workshop on Multimedia data mining: mining integrated media and complex data MDM '05**

Publisher: ACM Press

Full text available:  pdf(289.84 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper is dedicated to revisiting image and video mining techniques from the viewpoint of image modeling approaches, which constitute the theoretical basis for these techniques. The most important areas belonging to image or video mining are: image knowledge extraction, content-based image retrieval, video retrieval, video sequence analysis, change detection, model learning, as well as object recognition. Traditionally, these areas have been developed independently, and hence have not benefi ...

Keywords: content-based image retrieval, image mining, image model, pattern recognition, video mining

12 Pens & sketching: Hierarchical parsing and recognition of hand-sketched diagrams

 Levent Burak Kara, Thomas F. Stahovich

October 2004 **Proceedings of the 17th annual ACM symposium on User interface software and technology UIST '04**

Publisher: ACM Press

Full text available:  pdf(420.41 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A long standing challenge in pen-based computer interaction is the ability to make sense of informal sketches. A main difficulty lies in reliably extracting and recognizing the intended set of visual objects from a continuous stream of pen strokes. Existing pen-based systems either avoid these issues altogether, thus resulting in the equivalent of a drawing program, or rely on algorithms that place unnatural constraints on the way the user draws. As one step toward alleviating these difficult ...

Keywords: Simulink, pen computing, pnns, sketch understanding, symbol recognition, visual parsing

13 Dependency networks for inference, collaborative filtering, and data visualization

David Heckerman, David Maxwell Chickering, Christopher Meek, Robert Rounthwaite, Carl Kadie

September 2001 **The Journal of Machine Learning Research**, Volume 1

Publisher: MIT Press

Full text available:  pdf(337.07 KB) Additional Information: [full citation](#), [abstract](#), [citations](#)

We describe a graphical model for probabilistic relationships--an alternative to the Bayesian network--called a dependency network. The graph of a dependency network, unlike a Bayesian network, is potentially cyclic. The probability component of a dependency network, like a Bayesian network, is a set of conditional distributions, one for each node given its parents. We identify several basic properties of this representation and describe a computationally efficient procedure for learning the gra ...

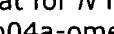
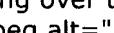
14 Model Averaging for Prediction with Discrete Bayesian Networks

Denver Dash, Gregory F. Cooper

December 2004 **The Journal of Machine Learning Research**, Volume 5

Publisher: MIT Press

Full text available:  pdf(267.17 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

In this paper we consider the problem of performing Bayesian model-averaging over a class of discrete Bayesian network structures consistent with a partial ordering and with bounded in-degree k . We show that for N nodes this class contains in the worst-case at least  distinct network structures, and yet model averaging over these structures can be performed using  ...

15 Associative Clustering for Exploring Dependencies between Functional Genomics Data Sets

Samuel Kaski, Janne Nikkila, Janne Sinkkonen, Leo Lahti, Juha E. A. Knuutila, Christophe Roos

July 2005 **IEEE/ACM Transactions on Computational Biology and Bioinformatics (TCBB)**, Volume 2 Issue 3

Publisher: IEEE Computer Society Press

Full text available:  pdf(896.56 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

High-throughput genomic measurements, interpreted as cooccurring data samples from multiple sources, open up a fresh problem for machine learning: What is in common in the different data sets, that is, what kind of statistical dependencies are there between the paired samples from the different sets? We introduce a clustering algorithm for exploring the dependencies. Samples within each data set are grouped such that the dependencies between groups of different sets capture as much of pairwise d ...

Keywords: Index Terms- Biology and genetics, clustering, contingency table analysis, machine learning, multivariate statistics.

16 Distributing a chemical process optimization application over a gigabit network

 Robert L. Clay, Peter A. Steenkiste

December 1995 **Proceedings of the 1995 ACM/IEEE conference on Supercomputing (CDROM) - Volume 00 Supercomputing '95**

Publisher: ACM Press

Full text available:  pdf(418.23 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)
 html(2.65 KB)

We evaluate the impact of a gigabit network on the implementation of a distributed chemical process optimization application. The optimization problem is formulated as a stochastic Linear Assignment Problem and was solved using the Thinking Machines CM-2 (SIMD) and the Cray C-90 (vector) computers at PSC, and the Intel iWarp (MIMD) system at CMU, connected by the Gigabit Nectar testbed. We report our experience distributing the application across this heterogeneous set of systems and present mea ...

Keywords: chemical process optimization, distributed computing, heterogeneous computing, gigabit networks, stochastic linear assignment problem, optimal resource allocation

17 Efficient discovery of error-tolerant frequent itemsets in high dimensions

 Cheng Yang, Usama Fayyad, Paul S. Bradley

August 2001 **Proceedings of the seventh ACM SIGKDD international conference on Knowledge discovery and data mining KDD '01**

Publisher: ACM Press

Full text available:  pdf(1.11 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We present a generalization of frequent itemsets allowing for the notion of errors in the itemset definition. We motivate the problem and present an efficient algorithm that identifies error-tolerant frequent clusters of items in transactional data (customer-purchase data, web browsing data, text, etc.). The algorithm exploits sparseness of the underlying data to find large groups of items that are correlated over database records (rows). The notion of transaction coverage allows us to extend th ...

Keywords: Error-tolerant frequent itemset, clustering, collaborative filtering, high dimensions, query selectivity estimation

18 Pac-bayesian generalisation error bounds for gaussian process classification

Matthias Seeger

March 2003 **The Journal of Machine Learning Research**, Volume 3

Publisher: MIT Press

Full text available:  pdf(487.11 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Approximate Bayesian Gaussian process (GP) classification techniques are powerful non-parametric learning methods, similar in appearance and performance to support vector machines. Based on simple probabilistic models, they render interpretable results and can be embedded in Bayesian frameworks for model selection, feature selection, etc. In this paper, by applying the PAC-Bayesian theorem of McAllester (1999a), we prove distribution-free generalisation error bounds for a wide range of approxima ...

Keywords: Bayesian learning, Gaussian processes, Gibbs classifier, Kernel machines, PAC-Bayesian framework, convex duality, generalisation error bounds, sparse approximations

19 Poster session 1: Causal probabilistic input dependency learning for switching model in VLSI circuits

Nirmal Ramalingam, Sanjukta Bhanja

April 2005 **Proceedings of the 15th ACM Great Lakes symposium on VLSI GLSVSLI '05****Publisher:** ACM PressFull text available:  pdf(59.42 KB)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Switching model captures the data-driven uncertainty in logic circuits in a comprehensive probabilistic framework. Switching is a critical factor that influences dynamic, active leakage power, coupling noises in CMOS implementations. In this work, we model the input-space by a causal graphical probabilistic model that encapsulates the dependencies in inputs in a compact, minimal fashion and also allows for instantiations of the vector-space that closely match the underlying dependencies, with th ...

Keywords: Bayesian networks, cross-talk estimation, power estimation, probabilistic learning, vector compaction

20 Verb class disambiguation using informative priors

Mirella Lapata, Chris Brew

March 2004 **Computational Linguistics**, Volume 30 Issue 1**Publisher:** MIT PressFull text available:  pdf(389.74 KB)Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#), [review](#)

Levin's (1993) study of verb classes is a widely used resource for lexical semantics. In her framework, some verbs, such as give, exhibit no class ambiguity. But other verbs, such as write, have several alternative classes. We extend Levin's inventory to a simple statistical model of verb class ambiguity. Using this model we are able to generate preferences for ambiguous verbs without the use of a disambiguated corpus. We additionally show that these preferences are useful as priors fo ...

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21 [Constructing informative priors using transfer learning](#)

Rajat Raina, Andrew Y. Ng, Daphne Koller

 June 2006 **Proceedings of the 23rd international conference on Machine learning ICML '06**
Publisher: ACM Press

 Full text available: [pdf\(224.55 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Many applications of supervised learning require good generalization from limited labeled data. In the Bayesian setting, we can try to achieve this goal by using an informative prior over the parameters, one that encodes useful domain knowledge. Focusing on logistic regression, we present an algorithm for automatically constructing a multivariate Gaussian prior with a full covariance matrix for a given supervised learning task. This prior relaxes a commonly used but overly simplistic independenc ...

22 [Comparison of Bayesian and frequentist assessments of uncertainty for selecting the best system](#)

Koichiro Inoue, Stephen E. Chick

 December 1998 **Proceedings of the 30th conference on Winter simulation WSC '98**
Publisher: IEEE Computer Society Press

 Full text available: [pdf\(88.32 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

23 [Industrial and government applications track posters: A component-based framework for knowledge discovery in bioinformatics](#)

Julien Etienne, Bernd Wachmann, Lei Zhang

 August 2006 **Proceedings of the 12th ACM SIGKDD international conference on Knowledge discovery and data mining KDD '06**
Publisher: ACM Press

 Full text available: [pdf\(994.29 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Motivation: In the field of bioinformatics there is an emerging need to integrate all knowledge discovery steps into a standardized modular framework. Indeed, component-based development can significantly enhance reusability and productivity for short timeline projects with a small team. We present Interactive Knowledge Discovery and Data mining (*iKDD*), an application framework written in Java that was specifically designed for these purposes. Results: *iKDD* consists of a component-b ...

Keywords: bioinformatics, data mining, workflow

24 Classification in Networked Data: A Toolkit and a Univariate Case Study

Sofus A. Macskassy, Foster Provost

May 2007 **The Journal of Machine Learning Research**, Volume 8**Publisher:** MIT PressFull text available:  pdf(517.66 KB) Additional Information: [full citation](#), [abstract](#)

This paper is about classifying entities that are interlinked with entities for which the class is known. After surveying prior work, we present NetKit, a modular toolkit for classification in networked data, and a case-study of its application to networked data used in prior machine learning research. NetKit is based on a node-centric framework in which classifiers comprise a local classifier, a relational classifier, and a collective inference procedure. Various existing node-centric relati ...

25 KDD-99 conference reports: Profiling your customers using Bayesian networks Paola Sebastiani, Marco Ramoni, Alexander CreaJanuary 2000 **ACM SIGKDD Explorations Newsletter**, Volume 1 Issue 2**Publisher:** ACM PressFull text available:  pdf(1.22 MB) Additional Information: [full citation](#), [abstract](#), [citations](#)

This report describes a complete Knowledge Discovery session using Bayesware Discoverer, a program for the induction of Bayesian networks from incomplete data. We build two causal models to help an American Charitable Organization understand the characteristics of respondents to direct mail fund raising campaigns. The first model is a Bayesian network induced from the database of 96,376 Lapsed donors to the June '97 renewal mailing. The network describes the dependency of the probability of resp ...

Keywords: Bayesian networks, customer profiling, missing data**26 Assessing Approximate Inference for Binary Gaussian Process Classification**

Malte Kuss, Carl Edward Rasmussen

December 2005 **The Journal of Machine Learning Research**, Volume 6**Publisher:** MIT PressFull text available:  pdf(530.32 KB) Additional Information: [full citation](#), [abstract](#)

Gaussian process priors can be used to define flexible, probabilistic classification models. Unfortunately exact Bayesian inference is analytically intractable and various approximation techniques have been proposed. In this work we review and compare Laplace's method and Expectation Propagation for approximate Bayesian inference in the binary Gaussian process classification model. We present a comprehensive comparison of the approximations, their predictive performance and marginal likelihood e ...

27 Context-specific Bayesian clustering for gene expression data Yoseph Barash, Nir FriedmanApril 2001 **Proceedings of the fifth annual international conference on Computational biology RECOMB '01****Publisher:** ACM PressFull text available:  pdf(233.32 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The recent growth in genomic data and measurement of genome-wide expression patterns allows to examine gene regulation by transcription factors using computational tools. In this work, we present a class of mathematical models that help in understanding the connections between transcription factors and functional classes of genes based on genetic and genomic data. These models represent the joint distribution of transcription factor binding sites and of expression levels of a gene in a single ...

28 Transformational priors over grammars

Jason Eisner

July 2002 **Proceedings of the ACL-02 conference on Empirical methods in natural**

language processing - Volume 10 EMNLP '02**Publisher:** Association for Computational LinguisticsFull text available: [pdf\(185.17 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

This paper proposes a novel class of PCFG parameterizations that support linguistically reasonable priors over PCFGs. To estimate the parameters is to discover a notion of relatedness among context-free rules such that related rules tend to have related probabilities. The prior favors grammars in which the relationships are simple to describe and have few major exceptions. A basic version that bases relatedness on weighted edit distance yields superior smoothing of grammars learned from the Penn ...

29 Simulation coverage and generation for verification: Coverage directed test**generation for functional verification using bayesian networks**

Shai Fine, Avi Ziv

June 2003 **Proceedings of the 40th conference on Design automation DAC '03****Publisher:** ACM PressFull text available: [pdf\(162.58 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Functional verification is widely acknowledged as the bottleneck in the hardware design cycle. This paper addresses one of the main challenges of simulation based verification (or dynamic verification), by providing a new approach for *Coverage Directed Test Generation* (CDG). This approach is based on Bayesian networks and computer learning techniques. It provides an efficient way for closing a feedback loop from the coverage domain back to a generator that produces new stimuli to the test ...

Keywords: bayesian networks, coverage analysis, functional verification**30 Data mining (DM): DrC4.5: Improving C4.5 by means of prior knowledge**

Miriam Baglioni, Barbara Furletti, Franco Turini

March 2005 **Proceedings of the 2005 ACM symposium on Applied computing SAC '05****Publisher:** ACM PressFull text available: [pdf\(606.15 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

Classification is one of the most useful techniques for extracting meaningful knowledge from databases. Classifiers, e.g. decision trees, are usually extracted from a table of records, each of which represents an example. However, quite often in real applications there is other knowledge, e.g. owned by experts of the field, that can be usefully used in conjunction with the one hidden inside the examples. As a concrete example of this kind of knowledge we consider causal dependencies among the at ...

31 Special issue on ICML: Learning probabilistic models of link structure

Lisa Getoor, Nir Friedman, Daphne Koller, Benjamin Taskar

March 2003 **The Journal of Machine Learning Research**, Volume 3**Publisher:** MIT PressFull text available: [pdf\(479.67 KB\)](#) Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)

Most real-world data is heterogeneous and richly interconnected. Examples include the Web, hypertext, bibliometric data and social networks. In contrast, most statistical learning methods work with "flat" data representations, forcing us to convert our data into a form that loses much of the link structure. The recently introduced framework of *probabilistic relational models* (PRMs) embraces the object-relational nature of structured data by capturing probabilistic interactions between att ...

32 Identifying character non-independence in phylogenetic data using data mining techniques

Anne M. Maglia, Jennifer L. Leopold, Venkat Ram Ghatti

January 2004 **Proceedings of the second conference on Asia-Pacific bioinformatics - Volume 29 APBC '04**

Publisher: Australian Computer Society, Inc.

Full text available:  pdf(840.85 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Undiscovered relationships in a data set may confound analyses, particularly those that assume data independence. Such problems occur when characters used for phylogenetic analyses are not independent of one another. A main assumption of phylogenetic inference methods such as maximum likelihood and parsimony is that each character serves as an independent hypothesis of evolution. When this assumption is violated, the resulting phylogeny may not reflect true evolutionary history. Therefore, it is ...

Keywords: character independence, data mining, machine learning, phylogenetic data

33 Using Bayesian networks to analyze expression data

 Nir Friedman, Michal Linial, Iftach Nachman, Dana Pe'er

April 2000 **Proceedings of the fourth annual international conference on Computational molecular biology RECOMB '00**

Publisher: ACM Press

Full text available:  pdf(952.91 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

DNA hybridization arrays simultaneously measure the expression level for thousands of genes. These measurements provide a "snapshot" of transcription levels within the cell. A major challenge in computational biology is to uncover, from such measurements, gene/protein interactions and key biological features of cellular systems.

In this paper, we propose a new framework for discovering interactions between genes based on multiple expression measurements This framework buil ...

34 Evaluation of an inference network-based retrieval model

 Howard Turtle, W. Bruce Croft

July 1991 **ACM Transactions on Information Systems (TOIS)**, Volume 9 Issue 3

Publisher: ACM Press

Full text available:  pdf(2.40 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#), [review](#)

Keywords: document retrieval, inference networks, network retrieval models

35 A quasi-dependency model for structural analysis of Chinese BaseNPs

Zhao Jun, Huang Changning

August 1998 **Proceedings of the 36th annual meeting on Association for Computational Linguistics - Volume 1 , Proceedings of the 17th international conference on Computational linguistics - Volume 1**

Publisher: Association for Computational Linguistics

Full text available:  pdf(540.92 KB) Additional Information: [full citation](#), [abstract](#), [references](#)
 [Publisher Site](#)

The paper puts forward a quasi-dependency model for structural analysis of Chinese baseNPs and a MDL-based algorithm for quasi-dependency-strength acquisition. The experiments show that the proposed model is more suitable for Chinese baseNP analysis and the proposed MDL-based algorithm is superior to the traditional ML-based algorithm. The paper also discusses the problem of incorporating the linguistic knowledge into the above statistical model.

36 Discover knowledge from distribution maps using Bayesian networks

Norazwin Buang, Nianjun Liu, Terry Caelli, Rob Lesslie, Michael J. Hill

November 2006 **Proceedings of the fifth Australasian conference on Data mining and analytics - Volume 61 AusDM '06**

Publisher: Australian Computer Society, Inc.

Full text available:  pdf(358.94 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper applies a Bayesian network to model multi criteria distribution maps and to discover knowledge contained in spatial data. The procedure consists of three steps: pre processing map data, training the Bayesian Network model using distribution maps of Australia and testing the generalization and diagnosis of the model using individual states' maps. The Bayesian network that we used in this study is known as naïve Bayesian network. Results show that this environmental Bayesian net ...

Keywords: bayesian network, combining evidence, distribution maps, multi-criteria analysis

37 Exact Bayesian Structure Discovery in Bayesian Networks

Mikko Koivisto, Kismat Sood

December 2004 **The Journal of Machine Learning Research**, Volume 5

Publisher: MIT Press

Full text available:  pdf(261.89 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Learning a Bayesian network structure from data is a well-motivated but computationally hard task. We present an algorithm that computes the exact posterior probability of a subnetwork, e.g., a directed edge; a modified version of the algorithm finds one of the most probable network structures. This algorithm runs in time $O(n 2^n + n^{k+1}C(m))$, where n is the number of network variables, k is a constant maximum in- ...

38 Multilingual dependency parsing using Bayes Point Machines

Simon Corston-Oliver, Anthony Aue, Kevin Duh, Eric Ringer

June 2006 **Proceedings of the main conference on Human Language Technology Conference of the North American Chapter of the Association of Computational Linguistics**

Publisher: Association for Computational Linguistics

Full text available:  pdf(274.80 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

We develop dependency parsers for Arabic, English, Chinese, and Czech using Bayes Point Machines, a training algorithm which is as easy to implement as the perceptron yet competitive with large margin methods. We achieve results comparable to state-of-the-art in English and Czech, and report the first directed dependency parsing accuracies for Arabic and Chinese. Given the multilingual nature of our experiments, we discuss some issues regarding the comparison of dependency parsers for different ...

39 Noisy-OR Component Analysis and its Application to Link Analysis

Tomáš Šingliar, Miloš Hauskrecht

December 2006 **The Journal of Machine Learning Research**, Volume 7

Publisher: MIT Press

Full text available:  pdf(301.98 KB) Additional Information: [full citation](#), [abstract](#)

We develop a new component analysis framework, the *Noisy-Or Component Analyzer* (NOCA), that targets high-dimensional binary data. NOCA is a probabilistic latent variable model that assumes the expression of observed high-dimensional binary data is driven by a small number of hidden binary sources combined via noisy-or units. The component analysis procedure is equivalent to learning of NOCA parameters. Since the classical EM formulation of the NOCA learning problem is intractable, we d ...

40 Session 10: statistical timing analysis: Refined statistical static timing analysis

 through

Benjamin N. Lee, Li-C. Wang, Magdy S. Abadir

July 2006 **Proceedings of the 43rd annual conference on Design automation DAC '06**

Publisher: ACM Press

Full text available:  pdf(1.02 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Statistical static timing analysis (SSTA) has been a popular research topic in recent years. A fundamental issue with applying SSTA in practice today is the lack of reliable and efficient statistical timing models (STM). Among many types of parameters required to be carefully modeled in an STM, spatial delay correlations are recognized as having significant impact on SSTA results. In this work, we assume that exact modeling of spatial delay correlations is quite difficult, and propose an experim ...

Keywords: Bayesian learning, delay correlations, statistical timing

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- 41 [Papers: interacting with simulations: Auxiliary object knowledge influences visually-guided interception behavior](#)

Peter W. Battaglia, Paul R. Schrater, Daniel J. Kersten

August 2005 **Proceedings of the 2nd symposium on Applied perception in graphics and visualization APGV '05**

Publisher: ACM Press

Full text available: [pdf\(551.25 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This work investigated how humans integrate visual information with object knowledge for interception behavior. When attempting to intercept a moving object using only monocular visual information, the optimal interception position may be ambiguous—the observer may be viewing a small object that is near or a large object that is far away. Regardless, humans are quite adept at monocular interception so it is likely that additional information is incorporated to disambiguate the visual information ...

Keywords: bayes, interception, perceptual inference, virtual reality

- 42 [Online Only: ACM Transactions on Design Automation of Electronic Systems, vol. 11, issue 3 \(Novel Paradigms in System-Level Design\): A stimulus-free graphical probabilistic switching model for sequential circuits using dynamic bayesian networks](#)

Sanjukta Bhanja, Karthikeyan Lingasubramanian, N. Ranganathan

June 2004 **ACM Transactions on Design Automation of Electronic Systems (TODAES) , Proceedings of the 41st annual conference on Design automation DAC '04**, Volume 11 Issue 3

Publisher: ACM Press

Full text available: [pdf\(331.63 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We propose a novel, nonsimulative probabilistic model for switching activity in sequential circuits, capturing both spatio-temporal correlations at internal nodes and higher order temporal correlations due to feedback. This model, which we refer to as the temporal dependency model (TDM), can be constructed from the logic structure and is shown to be a dynamic Bayesian network. Dynamic Bayesian networks are extremely powerful in modeling high order temporal, as well as spatial, correlations; TDM ...

Keywords: Dynamic Bayesian networks, TDM, sequential circuits

- 43 [Task clustering and gating for bayesian multitask learning](#)

Bart Bakker, Tom Heskes

December 2003 **The Journal of Machine Learning Research**, Volume 4

Publisher: MIT Press

Full text available:  pdf(229.33 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Modeling a collection of similar regression or classification tasks can be improved by making the tasks 'learn from each other'. In machine learning, this subject is approached through 'multitask learning', where parallel tasks are modeled as multiple outputs of the same network. In multilevel analysis this is generally implemented through the mixed-effects linear model where a distinction is made between 'fixed effects', which are the same for all tasks, and 'random effects', which may vary bet ...

44 A BNF-based automatic test program generator for compatible microprocessor verification



Lieh-Ming Wu, Kuochen Wang, Chuang-Yi Chiu

January 2004 **ACM Transactions on Design Automation of Electronic Systems (TODAES)**, Volume 9 Issue 1

Publisher: ACM Press

Full text available:  pdf(306.47 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A novel Backus-Naur-form- (BNF-) based method to automatically generate test programs from simple to complex ones for advanced microprocessors is presented in this paper. We use X86 architecture to illustrate our design method. Our method is equally applicable to other processor architectures by redefining BNF production rules. Design issues for an *automatic program generator* (APG) are first outlined. We have resolved the design issues and implemented the APG by a *top-down recursive descent parsing* method ...

Keywords: Advanced microprocessor, BNF, automatic program generator, compatibility verification, coverage, top-down recursive descent parsing method

45 Users and communities: Bayesian adaptive user profiling with explicit & implicit feedback



Philip Zigoris, Yi Zhang

November 2006 **Proceedings of the 15th ACM international conference on Information and knowledge management CIKM '06**

Publisher: ACM Press

Full text available:  pdf(297.10 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Research in information retrieval is now moving into a personalized scenario where a retrieval or filtering system maintains a separate user profile for each user. In this framework, information delivered to the user can be automatically personalized and catered to individual user's information needs. However, a practical concern for such a personalized system is the "cold start problem": any user new to the system must endure poor initial performance until sufficient feedback from that user is ...

Keywords: Bayesian statistics, implicit feedback, information retrieval, user modeling

46 Sparse bayesian learning and the relevance vector machine

Michael E. Tipping

September 2001 **The Journal of Machine Learning Research**, Volume 1

Publisher: MIT Press

Full text available:  pdf(999.88 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

This paper introduces a general Bayesian framework for obtaining sparse solutions to regression and classification tasks utilising models linear in the parameters. Although this framework is fully general, we illustrate our approach with a particular specialisation that we denote the 'relevance vector machine' (RVM), a model of identical functional form to the popular and state-of-the-art 'support vector machine' (SVM). We demonstrate that by exploiting a probabilistic Bayesian learning framework ...

47 Local dependent components

 Arto Klami, Samuel Kaski

June 2007 **Proceedings of the 24th international conference on Machine learning ICML '07**

Publisher: ACM Press

Full text available:  pdf(316.78 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

We introduce a mixture of probabilistic canonical correlation analyzers model for analyzing local correlations, or more generally mutual statistical dependencies, in cooccurring data pairs. The model extends the traditional canonical correlation analysis and its probabilistic interpretation in three main ways. First, a full Bayesian treatment enables analysis of small samples (large p , small n , a crucial problem in bioinformatics, for instance), and rigorous estimation of the de ...

48 Multimedia simplification for optimized MMS synthesis

 Wei-Qi Yan, Mohan S. Kankanhalli

February 2007 **ACM Transactions on Multimedia Computing, Communications, and Applications (TOMCCAP)**, Volume 3 Issue 1

Publisher: ACM Press

Full text available:  pdf(9.63 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We propose a novel transcoding technique called *multimedia simplification* which is based on experiential sampling. Multimedia simplification helps optimize the synthesis of MMS (multimedia messaging service) messages for mobile phones. Transcoding is useful in overcoming the limitations of these compact devices. The proposed approach aims at reducing the redundancy in the multimedia data captured by multiple types of media sensors. The simplified data is first stored into a gallery for fu ...

Keywords: MMS synthesis, Multimedia simplification, experiential sampling, home care monitoring, hypermedia coherence, mobile phone, soccer video

49 MinReg: A Scalable Algorithm for Learning Parsimonious Regulatory Networks in Yeast and Mammals

Dana Pe'er, Amos Tanay, Aviv Regev

December 2006 **The Journal of Machine Learning Research**, Volume 7

Publisher: MIT Press

Full text available:  pdf(297.76 KB) Additional Information: [full citation](#), [abstract](#)

In recent years, there has been a growing interest in applying Bayesian networks and their extensions to reconstruct *regulatory networks* from gene expression data. Since the gene expression domain involves a large number of variables and a limited number of samples, it poses both computational and statistical challenges to Bayesian network learning algorithms. Here we define a constrained family of Bayesian network structures suitable for this domain and devise an efficient search algo ...

50 Anomalous system call detection

 Darren Mutz, Fredrik Valeur, Giovanni Vigna, Christopher Kruegel

February 2006 **ACM Transactions on Information and System Security (TISSEC)**, Volume 9 Issue 1

Publisher: ACM Press

Full text available:  pdf(645.58 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Intrusion detection systems (IDSs) are used to detect traces of malicious activities targeted against the network and its resources. Anomaly-based IDSs build models of the expected behavior of applications by analyzing events that are generated during the applications' normal operation. Once these models have been established, subsequent events are analyzed to identify deviations, on the assumption that anomalies represent evidence of an attack. Host-based anomaly detection systems often rely on ...

Keywords: Bayesian network, Intrusion detection, anomaly detection, computer security

51 Modeling changing dependency structure in multivariate time series 

 Xiang Xuan, Kevin Murphy

June 2007 **Proceedings of the 24th international conference on Machine learning**
ICML '07

Publisher: ACM Press

Full text available:  pdf(331.40 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

We show how to apply the efficient Bayesian changepoint detection techniques of Fearnhead in the multivariate setting. We model the joint density of vector-valued observations using undirected Gaussian graphical models, whose structure we estimate. We show how we can exactly compute the MAP segmentation, as well as how to draw perfect samples from the posterior over segmentations, simultaneously accounting for uncertainty about the number and location of changepoints, as well as uncertainty a ...

52 Optimal structure identification with greedy search 

David Maxwell Chickering

March 2003 **The Journal of Machine Learning Research**, Volume 3

Publisher: MIT Press

Full text available:  pdf(462.82 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

In this paper we prove the so-called "Meek Conjecture". In particular, we show that if a DAG H is an independence map of another DAG G , then there exists a finite sequence of edge additions and covered edge reversals in G such that (1) after each edge modification H remains an independence map of G and (2) after all modifications $G = H$. As shown by Meek (1997), this result has an important consequence for Bayesian approaches to learning Bayesian ne ...

53 Bayesian analysis for simulation input and output 

 Stephen E. Chick

December 1997 **Proceedings of the 29th conference on Winter simulation WSC '97**

Publisher: ACM Press, IEEE Computer Society

Full text available:  pdf(858.19 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

54 Selecting the best system: a decision-theoretic approach 

 Stephen E. Chick

December 1997 **Proceedings of the 29th conference on Winter simulation WSC '97**

Publisher: ACM Press, IEEE Computer Society

Full text available:  pdf(841.07 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

55 Classics in software engineering 

January 1979 Divisible Book

Publisher: Yourdon Press

Additional Information: [full citation](#), [cited by](#), [index terms](#)

56 A Unifying View of Sparse Approximate Gaussian Process Regression 

Joaquin Quiñonero-Candela, Carl Edward Rasmussen

December 2005 **The Journal of Machine Learning Research**, Volume 6

Publisher: MIT Press

Full text available:  pdf(294.75 KB) Additional Information: [full citation](#), [abstract](#)

We provide a new unifying view, including all existing proper probabilistic sparse approximations for Gaussian process regression. Our approach relies on expressing the *effective prior* which the methods are using. This allows new insights to be gained, and highlights the relationship between existing methods. It also allows for a clear theoretically justified ranking of the closeness of the known approximations to the corresponding full GPs. Finally we point directly to designs of new bet ...

57 Dependency preserving probabilistic modeling of switching activity using bayesian networks



Sanjukta Bhanja, N. Ranganathan

June 2001 **Proceedings of the 38th conference on Design automation DAC '01**

Publisher: ACM Press

Full text available: [pdf\(226.44 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We propose a new switching probability model for combinational circuits using a**Logic-Induced-Directed-Acyclic-Graph**(LIDAG) and prove that such a graph corresponds to a**Bayesian Network**guaranteed to map all the dependencies inherent in the circuit. This switching activity can be estimated by capturing complex dependencies (spatio-temporal and conditional) among signals efficiently by local message-passing based on the Bayesian networks. Switching activity estimation of ISCAS and ...

58 Research sessions: query optimization: CORDS: automatic discovery of correlations and soft functional dependencies



Ihab F. Ilyas, Volker Markl, Peter Haas, Paul Brown, Ashraf Aboulnaga

June 2004 **Proceedings of the 2004 ACM SIGMOD international conference on Management of data SIGMOD '04**

Publisher: ACM Press

Full text available: [pdf\(559.35 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

The rich dependency structure found in the columns of real-world relational databases can be exploited to great advantage, but can also cause query optimizers---which usually assume that columns are statistically independent---to underestimate the selectivities of conjunctive predicates by orders of magnitude. We introduce CORDS, an efficient and scalable tool for automatic discovery of correlations and soft functional dependencies between columns. CORDS searches for column pairs that might have ...

59 Acoustic modeling: MAP estimation of continuous density HMM: theory and applications



Jean-Luc Gauvain, Chin-Hui Lee

February 1992 **Proceedings of the workshop on Speech and Natural Language HLT '91**

Publisher: Association for Computational Linguistics

Full text available: [pdf\(644.05 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

We discuss *maximum a posteriori* estimation of continuous density hidden Markov models (CDHMM). The classical MLE reestimation algorithms, namely the forward-backward algorithm and the segmental k -means algorithm, are expanded and reestimation formulas are given for HMM with Gaussian mixture observation densities. Because of its adaptive nature, Bayesian learning serves as a unified approach for the following four speech recognition applications, namely parameter smoothing, speaker ...

60 Artificial intelligence



Elaine Rich

January 1983 Book

Publisher: McGraw-Hill, Inc.

Additional Information: [full citation](#), [abstract](#), [references](#), [cited by](#), [review](#)

The goal of this book is to provide programmers and computer scientists with a readable introduction to the problems and techniques of artificial intelligence (A.I.). The book can be used either as a text for a course on A.I. or as a self-study guide for computer

professionals who want to learn what A.I. is all about.

The book was designed as the text for a one-semester, introductory graduate course in A.I. In such a course, it should be possible to cover all of the material in the boo ...

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Conditional probabilities are determined for **test** states by examining **dependencies** of conclusion links on the outcome nodes in the decision **flowchart** ...

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26B depicts a **flowchart** of the steps performed by the **Bayesian** network The **test** network 608 received as input is either the **prior** network or a **test** ...

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